

2. Claims 1-3, 6, 8-11 and 21-37 were rejected under 35 U.S.C. § 103 as being unpatentable over Fox et al. (U.S. Patent No. 5,285,347) in view of Hamilton et al. (5,901,037);

3. Claim 4 was rejected under 35 U.S.C. § 103 as being unpatentable over Fox et al. in view of Hamilton et al., and further in view of applicant's omission of known/convention prior art.

Each of these will be addressed in turn.

1. Subject Matter of the Various Claims

Applicants have advised Applicants' attorney that the Examiner is correct in his presumption that the subject matter of the various claims was commonly owned at the time any inventions covered by the claims therein were made.

2. Rejection of claims 1-3, 6, 8-11 and 21-37 under 35 U.S.C. § 103 as being unpatentable over Fox et al. in view of Hamilton et al.

The Examiner states that Fox et al. in Figures 1-6 disclose all the claimed features of the invention with the exception of the micro-channels, inlet and outlet end caps. Regarding "a low profile"/the size of the member and the channel size, a change in size is stated to be generally recognized as being within the level or ordinary skill in the art. The Examiner further states that Hamilton et al. in Figures 12-13 disclose a heat exchanger having a plurality of micro-channels and inlet and outlet end caps for the purpose of increasing the heat transfer rate away from an electronic device and increasing the heat transfer efficiency of the heat exchanger. The Examiner concludes that it would have been obvious at the time the invention was made to a person of

ordinary skill in the art to employ in Fox et al. the heat exchanger having a plurality of micro-channels and inlet and outlet end caps.

First, with respect to Fox et al., there is disclosed a hybrid heat sink 20 having a cavity 16. Fox et al. states that “it may be appropriate to cast the hybrid heat sink 20 in two sections and join the sections along line 40 by a brazing or soldering process.” Col. 5, ll. 49-51. Fox et al. further states that in an alternate configuration “the hybrid heat sink could be manufactured by *drilling holes* 80, 82, 84 and 86 through the body of the hybrid heat sink 20 in a common plane[.]”

(Emphasis added) Col. 5, ll. 57-58. Further, Fox et al. states that

[T]he serpentine path taken by the cavity is arranged such that the distance 48 between the sections of the cavity is sufficient to allow heat to be conducted to the top surface of the hybrid heat sink 20, while allowing sufficient cavity space for sufficient internal circulation of the fluid and for heat transfer to the fluid. *This is necessary, because*, in the event of the failure of the pump, the liquid would cease to flow. Liquid which is not flowing has poor thermal conductivity and operates as a thermal barrier. (Emphasis added) Col. 6, ll. 4-14.

/ Fox et al. not only teaches a *non-unitary* member, as is evidenced by the only two construction methods taught or disclosed in Fox et al., but Fox et al. states that there must be an explicit amount of space to prevent failure of the hybrid heat sink in the case of pump failure. In addition, Fox et al. is silent as to the shape of the cavities, and the existence of the thermodynamic relationship between the shape of the cavities and the item which is desired to be cooled. The

present invention teaches a low profile metal *unitary member* having a plurality of micro-tubes *having a flattened heat transfer surface*. This is a distinct advantage. The benefits of the unitary formation of the invention of claim 1 are inherent in at least an elimination of an unnecessary construction step that is required by Fox et al. The benefits of the shape of the flattened heat transfer surface of the micro-tubes in the present invention is explicitly set forth in the specification on page 7, lines 1-6. Specifically, the flat surface is formed on the bottom side of the micro tube "for contacting heat generating components 12". The direct contact and greater surface area of contact provide for a much more efficient heat transfer means than that of Fox et al.

Hamilton et al. does not cure the problems of Fox et al. In fact, the cooling apparatus Hamilton et al. is clearly not a "unitary member" since each micro-channel 16 is not completely closed until the substrate 14 containing the micro-channels 16 is connected to a channel closure member 26, as shown in Figure 2. *See also* Col. 3, ll. 52-57 and col. 3, l. 1 through col. 4, l 2. It is further submitted that Hamilton et al. requires the use of the specially designed valves 46i and 46o which have no moving parts for controlling the flow of coolant. Not even alternate embodiments such as that in Figure 3 of Hamilton et al. show a low profile *unitary* member as that disclosed and taught in the present invention.

Even when Fox et al. *and* Hamilton et al. are combined a low profile unitary member having a plurality of micro tubes with a flattened heat transfer surface is not suggested. In fact, the combination of Fox et al. with Hamilton et al., or all other art before the Examiner illustrating micro tubes, teaches away from the use of micro tubes to maximize the number of tubes in the

cooling device, as Fox et al. *must make use of sufficient space between tubes* in its device to allow for operation of the cooling apparatus should the liquid-cooling feature of Fox et al. fail, as described above.

Finally, it is submitted that the present invention eliminates unnecessary multiple parts through its use of a low profile metal unitary member. Both Fox et al., and Hamilton et al. *require* more than one member to make their respective cooling apparatuses. Neither Fox et al. nor Hamilton et al. teach or suggest alone or in combination a unitary member with micro tubes having a flattened heat transfer surface. Nor do Fox et al. and Hamilton et al. discuss the benefits of such flattened heat transfer surfaces in a low profile metal unitary member.

It is therefore respectfully submitted that neither Fox et al. nor Hamilton et al., alone or in combination, teach or suggest the claimed features of the present invention. Favorable action on the claims as they are currently before the Examiner is hereby requested.

3. Rejection of claim 4 under 35 U.S.C. § 103 as being unpatentable over Fox et al. in view of Hamilton et al., and further in view of applicant's omission of known/convention prior art

Claim 4 is submitted to be allowable over Fox et al. in view of Hamilton et al. for the reasons submitted above. Favorable action on the claim is hereby requested.

4. Submission of IDS Herewith

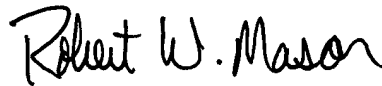
Applicants submit under separate filing an IDS disclosing U.S. Patent No. 6,032,726 to

Wright et al. Consideration of the present invention in view of Wright et al. is hereby requested. Applicants respectfully submit that the claims pending before the Examiner in the present application are allowable over Wright et al.

In view of the foregoing, Applicant respectfully requests the thorough reconsideration of this application and earnestly solicits an early notice of allowance.

Respectfully submitted,

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